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ABSTRACT

The overall aim of the study "Children's Use of Electronic Technologies in the Home" was to examine the access to and use of electronic technologies in the homes of primary-school-aged children. The impact of electronic technologies on the children's lives, particularly with reference to their schooling was also discussed. This stage of the study extended the findings of two previous studies through a closer examination of children's use of computer technologies in "technology rich" families and explored the perceptions and beliefs of children, parents, and teachers about the children's use of the computer technologies in their homes, particularly as they relate to learning and schooling. Fourteen children from ages 10 to 12 years old kept a daily record of their home computing activities for two weeks, and were interviewed about their computer use. The parents and teachers of the children were also interviewed. Results are presented in the following categories: "The Family Computing Environment"; "The Use of the Computer for Work Within the Home"; "The Use of the Computer for Recreation Within the Home"; "The Impacts of the Computer on Family Life"; "The School Computing Environment"; and "Common Themes in the Home and the School." (Contains bibliography.) (SWC)

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Children's Use of Electronic Technologies in the Home

(based on structured interviews with 14 children, their parents and their teachers from a wide cross section of urban Sydney)

January 1997

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1. Summary

The purpose of this part of the study, Stage 3, was to extend the previous findings through a closer examination of children's use of computer technologies in "technology rich" families and to explore the perceptions and beliefs of children, parents and teachers about the children's use of the computer technologies in their homes.

The results of this part of the study clearly indicate that:

- In all the families that owned computers there were members of the family who became the within-house experts and/or decision makers, there are also family members who didn't like or don't use the computer. In different families father, mothers, brothers and sisters played all of these roles
- Families that owned computers were classified into three types:
    - Technology rich families,
    - technology capable families and
    - technology emerging families.

  Characteristics which defined these groups included, amount and type of equipment in the home, duration of ownership, degree of technical and user expertise within the family, the existence of one or more strong enthusiasts who leads and teaches, and degree of the children's participation in a wide range of computing activities.
- The Internet played a significant role in the lives of some members of most 'technology rich' and some 'technology capable' families.
- Three themes to emerge in discussions with parents about the family use of computers were:
    1. sociability: the use of community space and time, with computing generally being seen as an individual pursuit;
    2. using and saving time: the use of time, with computing activities being seen both as time-consuming and time-saving;
    3. safety: the safety of the children, with computing keeping children at home more but bringing other safety issues inside the home, such as access to inappropriate and harmful information on the Internet and access to vicarious experiences of violence, through games.
- Parents had strong views about the role schools should play in computer education. Teachers had positive views about how home computers could aid children's education.
- Most parents, teachers and children agreed that word processing, desktop publishing and accessing information from electronic sources are key skills for children of this age.

- Access to equipment within a school was not the major factor in determining whether teachers are able / choose to integrate computing into the teaching and learning within their classrooms.

- Both teachers and parents identified their children's computing activities as contributing to gaining new and necessary skills for the rapidly changing world and to losing important skills related to print technologies.

- Many parents and teachers believed that possession of strong computing skills and interests (including game playing) has the potential to increase a child's self esteem and to provide opportunities for leadership within the family and their school.

- Teachers particularly identified children's need to learn how to effectively handle large amounts of information as a key skill which needs much emphasis, particularly with regard to accessing information from the Internet and other electronic sources.

2. Background

The overall aim of the study Children's Use of Electronic Technologies in the Home is to examine the access to and use of electronic technologies in the homes of primary-school-aged children and the impact of these on the children's lives, particularly with reference to their schooling.

The significance of the study stems from the rapid technological changes occurring in our society and the growing gap between children's experience of these technologies in their two worlds of home and school. While Australia is still a decade or so away from home saturation through the new broad band technologies, the rate of purchase of home computers is so rapid that industry pundits predict that the home market will soon represent 20% of total sales of personal computers in Australia and that household ownership will increase to around 35% in the near future. In households with school age children, it is reported that home ownership in capital cities is approaching 50% (Australian Bureau of Statistics, 1996). In some affluent communities within these capital cities, teachers estimate that over 85% of the children in their classes have access to computers in their homes.

While these changes are occurring outside of school, little if any significant changes have occurred inside schools. While on the surface it appears that schools are embracing the new technologies, for example the recent NSW government initiative will provide all government schools in NSW with Internet access, recent studies in a number of countries found that very few teachers have really integrated the use of new technologies into their classrooms. In fact, a number of studies suggest that regardless of the changing nature and amount of equipment in schools, little progress has been made on this front in the last ten years (Marcinkiewicz, 1993-4). This failure of schools and school systems to respond to the challenges of the new technologies places many of today's children in an invidious position where their world of leisure, entertainment and informal learning is firmly based in the electronic media while their classroom world of formal learning is still embedded in print. For other children, who do not have access to computing resources in their homes, it exacerbates the growing gap between children from 'technology rich' and 'technology poor' families.

A small number of authors have examined children's use of computers and electronic game playing. Generally these studies have taken a psychological perspective and examined "the impact on" children. Few studies have been found so far that seek children's views and opinions about their immersion in the electronic world. Recently the Australian Broadcasting Authority completed a study on Families and Electronic Entertainment (1996). This study examined a range of leisure activities and issues surrounding the use of a wide range of electronic technologies in the home. Throughout the three stages of the current study (Downes et al 1995, 1996) children have been provided with an opportunity to express their views on a range of important matters associated with their access and use of computing technologies for work and leisure in their homes and their schools. This focus on children's perspectives about home use for work and leisure, at this particular time in the history of the technology makes this study unique within Australia and the rest of the world.

In 1995, Stage One of the study into *Children's Use of Electronic Technologies in the Home* was completed. In this stage researchers held discussions with 190 children from three schools in south western Sydney. These children ranged in age from five to twelve years of age. They were selected on the basis that their parents had reported them as regular users of computers in their homes. In these discussions the children described the physical and social environments within which they used the computers. Topics ranged from who owned the computer/s, where it was located, who used it most, how the children used it, what rules surrounded the use of the computer, how the children learnt to use the computer and the children's perceptions about the differences between home and school computing. The results have been published in a report in 1995[1].

Stage Two of the study, completed in 1996, was designed to seek clarification of many of the issues raised in the first stage of the research. In particular, an attempt was made to see what similarities and differences existed across children who regularly used computers at home, and across their families and communities. The following characteristics were identified as key factors that are associated with differences: the gender and age of the child, the expertise of the parents, the computing resources available in the homes and the experiences the children encountered within their schools. The results of this stage of the study was published in February 1996.[2]

3. Purpose

The aim of this part of the study, Stage 3, was to extend the previous findings through a closer examination of children's use of computer technologies in "technology rich" families and to explore the perceptions and beliefs of children, parents and teachers about the children's use of the computer technologies in their homes, particularly as they relate to learning and schooling.

4. Design and Procedures

Eight schools took part in this stage of the study. They were drawn from the eleven schools that had taken part in Stage 2 of the study. The eight schools selected represented the wide spectrum of school types: government and non-government (wealthy independent and Catholic systemic) schools, single-sex and co-educational schools and primary schools or junior schools or departments within Colleges with classes to Year 12. The eight school communities represented a wide range of social, economic, cultural and language

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[1] Downes. T. Reddacliff. C.. and Moont. S. (1995) A Preliminary Report of Children's Use of Electronic Technologies in the Home. University of Western Sydney. Macarthur. Campbelltown. NSW 2560.

[2] Downes. T.. Reddacliff. C.. & Moont. S. (1996) Stage 2 Preliminary Report of Children's Use of Electronic Technologies in the Home. University of Western Sydney. Macarthur. Campbelltown. NSW 2560.

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backgrounds. In two cases translators and interpreters were employed to communicate with families where English was not the first language spoken at home.

The study involved fourteen children from thirteen families (one family of twins were included). All of the children were in upper primary classes, with ages ranging from 10 years to 12 years of age. Selection of children took account of the child's gender and the computing resources in the home.

These children had taken part in Stage Two of the study and were identified by the researchers and their schools as coming from 'technology rich' home environments (in relation to other children in their classes). In half of the families the computing resources in the home included modems and access to the Internet and /or other networked resources.

In order for the children to take part in Stage 3 of the study, the involvement of their parents and teachers was necessary. In three instances after permission had been given either parents or teachers withdrew from the study. In each of these cases the remaining participants were still included in the analyses.

For children, participation in the study involved keeping a daily record of computing activities for a two week period and participating in an interview during the school day. For parents, participation involved interviews in the family home, involving one or both parents. Parents, themselves, chose who would participate depending on parental preference and availability. For teachers, participation involved an interview at school, out of school hours. In all but one case, the teachers interviewed were the classroom teachers of the children in the study. In one case the school's specialist computer teacher was interviewed, when the classroom teacher was unavailable.

The following sequence was generally followed for each of the children

1. For a period of two weeks prior to the interviews, the children's use of the computer technologies in their homes was recorded, using a daily diary.
2. The child was interviewed using a structured interview about their use of the computer. The diary was used to prompt the child's memory of recent computing activities. Any issues that emerged from an analysis of the log were also raised with the children.
3. Parent/s were interviewed using a structured interview. Where necessary, statements made by the children were checked with the parent/s..
4. The child's class teacher was interviewed using a structured interview. Where necessary, statements made by the children were checked with the teacher.

The children's diaries were analysed in terms of frequency of use, type of programmes used, and the responses the children made regarding the social context of computer use, and the nature of the activity and learning that occurred. All interviews were tape recorded and transcribed with transcriptions being checked for accuracy. The amended transcripts were analysed for elaboration of existing themes from the previous stages or emerging themes that

specifically related to 'technology rich' families including perspectives from parents and teachers.

5. Results

The following section details the results of the analysis of the children's, parents' and teachers' interviews. Within the family computing environment, the differences and similarities between family's level or resources, expertise and beliefs have been detailed. Within the school environment the resources and expertise with the school have also been detailed. As well, key issues to emerge within the family and later, key issues common to both home and school are discussed.

5.1 The Family computing environment

One of the key selection criteria for the children was that their family represented a 'technology rich family' within their particular school community (the child's class or school). There was significant variation across the school communities in terms of this comparative notion. As can be seen below, some families had a wide range of 'cutting edge' computing technologies in their homes and had had equipment in their homes for ten years or more, while other families, considered a 'technology rich' family compared to other families in their school community had only recently purchased their first computer. In order to understand the children's and parents' home experiences and views it is important to appreciate the commonalities and differences between the families.

One common feature of these families was that almost all of them had a family member who didn't like or didn't use the family's computers. This included fathers, mothers, brothers and sisters. As one parent said of himself *"Oh I don't use it at all. I was using it last year, mainly the CD Rom ...but I've been very distracted in the last months"*; another said of her husband *"I don't think he's that keen on computers really"*. Another parent said of one of his sons *"... has never shown any interest in sitting down and doing it"*.

5.1.1 The 'technology rich' families

Four of the thirteen families (two girls' and two boys' families) could well be considered 'technology rich' families in terms of comparisons with national standards as measured in the recent Australian Bureau of Statistics (1996) study. These families came from professional and middle class Anglo-Australian families in a variety of geographical locations in urban Sydney. Their children attended the full range of school types.

These families have had computers in their homes for ten years or more. There were several working computers in each of the homes, and a range of peripheral devices such as colour printers, CD Rom drives, and modems. Other devices found in these homes included a flat bed scanner, two zip drives and a local area network. All of these homes had access to the Internet and/or other networked resources, such as bulletin boards. In the last twelve months each of these families had upgraded hardware or added to their software collection through purchase

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or downloading from networks. One family had over 100 software titles on CD Roms, few of them were games.

In all cases the computers came into the homes because of the work needs or interests of one or both parents and at least one of the parents had developed some expertise and confidence which they shared with their children. In general, the fathers played a dominant role in these families in terms of decision making and leadership with their children. In most of these homes there was considerable technical expertise within the family, sometimes being the father, older brother or the male child himself. As well there was considerable software expertise and Internet know-how within both male and female members of the family.

Within these families, all children engaged in the common computing activities of playing games, word processing and accessing information. As well all were regular users of the Internet and/or other networked resources. Most of these children also manipulated images (photos and graphics) and/or sounds and commercial music using a range of multimedia software. Listening to their own CDs through the computer, while they worked on other computing tasks was also a common activity.

The children in these families used the Internet to send and receive email from existing friends or new friends located through their activities on the Internet or other networked services, to 'chat' in either moderated or unmoderated 'rooms', and to browse and search for topics of interest. As well the boys in these families used the Internet and bulletin boards to download games, games editors and cheats, and download software and accessories. One boy collected viruses just to see which ones were new and how they were created. One girl, who was about to visit New York with her family, helped her mother book tickets for a show, and spent time browsing other New York sites, including images of traffic flow at major intersections.

5.1.2 The 'technology capable' families

Seven families, though considered 'technology rich' by comparison to some other children in their school communities, more accurately reflected a computing environment becoming more common within Australian households with children (Australian Bureau of Statistics, 1996). These families came from a range of social, economic, cultural and language backgrounds and their children attended schools of all types.

These families obtained their first computer about 3-8 years ago. Equipment in the home, included one or more working computers, CD Roms, printers, sometimes colour printers, and in some families, modems. In some cases the modems were connected to the Internet or other networked resources. A number of these families had upgraded their computers at least once. In one of these families, the child had worked out how to make phone calls using telecommunications software and the modem, and commented on how much easier it was to talk to his uncle about problems if he was already seated at the computer and just talked into the microphone.

Family reasons for purchasing the computer related to the children's educational needs and /or to the parent/s' work-related needs. In a number of cases parents spoke of the 'sacrifices' that were made to purchase the equipment, and/or how the cost of Internet access was a concern.

In four of these families the mothers were the main within-family support person for their children with considerable expertise in some software packages. In some cases they were also the catalysts for the original purchase.

In all of these families one or more parents used computers in the home to some extent for work-related or personal use. In one family the parents only used an older computer as it had the appropriate fonts and software for word processing in the Cambodian language. In another family the mother regularly used the computer for a range of activities including professional correspondence through email with a number of overseas colleagues and business associates. Few if any of these parents had technical expertise, though many had significant expertise in particular software types or processes, such as desktop publishing. Two of the boys within these families had an extended family member, a brother-in-law and an uncle, offering much technical support. Interestingly in both of these cases the boys commented admiringly about their mothers' touch typing skills.

The boys in three of these families were computing enthusiasts, one even building computers with the help of his brother-in-law and playing networked games through a local network and modem connections. Another, became a keen Internet user, engaging in a wide range of Internet activities. Many of these activities took place at his friend's place. The third boy became very creative with the multimedia package Hypercard, originally learnt at school. The fourth boy was not a general enthusiast but was keen on games and good at typing. He often received recognition in the family and at school for his typing ability.

The three girls in the remaining families and the female twin of one of the above mentioned boys, played games, word processed and accessed information from the CD Roms. In three of the four cases their siblings, the twin, and two older sisters, were the main users of the family computers. All four girls enjoyed word processing, desktop publishing (using borders, font types, colours, size and / or word art to improve the design and layout of their word processed texts) and accessing information from CD Rom sources for school work and for leisure. In three of these cases, the girls had developed significant expertise in these processes and this expertise was recognised at home and at school.

One of the four girls had used the Internet with her father. They were learning together, but had found the process somewhat frustrating because they were unable to narrow their searches down to a reasonable 'hit rate' and hence find the information they were looking for.

5.1.3 The 'technology emerging' families

Two families in the study were not included in either of the above groups. Both families came from school communities where very few children in their classes had computers in their homes. These families illustrate at least two other pathways that parents are using to bring their children and their homes into the 'computing age'.

The first family were given a Dos-based computer about 12 months ago by the mother's employer. The boy regularly played games from a wide selection of disks that have been given to the family by various people. Although he occasionally typed printed material out of books, he did not word process school work as there is no printer. Through her work place, the

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mother had access to CD Rom-based information and to the Internet. She occasionally brought home information related to school projects. Mother and child, also visited the local library and used the computer to access information.

The second family have had a computer in the home for just over twelve months. The parents purchased the computer solely for their girls' education. They had no interest or expertise in using computers. The computer, which resided in the oldest sister's bedroom, had a CD Rom, printer and modem, though it was not connected to the Internet. The oldest sister, who was taking computing as part of her high school studies was the main user, decision maker and teacher/leader with her five younger siblings. The girl (in the study) played games, mainly with her younger sister, word processed and accessed information from the CD Rom drive for her school projects. She did not demonstrate confidence in her computing skills, nor did she receive any recognition for her skills at school.

5.1.4 Family's views about the importance of computing skills

As well as having computer ownership in common, these families considered being able to operate a computer essential for functioning in the modern world. Gaining computer skills was seen as valuable for personal development and possible future employment. Parents believed it was important to be able to use the computer as a tool to fulfil specific needs in addition to being aware of current technological developments.

One parent summed it up by saying that *"I think the way the world is going now towards computers, kids have to be computer literate"*. Another said *"The whole concept is to make them comfortable with the use of computers so that they, as they have more and more need to use them, as they continue their education, they'll be confident rather than scared and so that computing is useful and it becomes second nature, and not something special"*.

Other parents linked it directly to employment *"When they go for jobs I think it's a big plus to be confident in handling a computer and being able to use it"*. Another parent said *"I like them to be involved in technology and we have computer technology in our work environment as well, so I recognise the ones in our office environment who are computer literate seemed to be able to get ahead in their work and they become highly respected in the work environment too. Advancement is easier for them"*.

Parents also pointed out that this was different from the way they had been brought up, saying *"Kids have got to grow up with technology more than what we did"* and that today's children were naturally more comfortable with the technology *"I think that they don't have the same sense of awe and wonder about it that we had. They just see it as one of the things that they use"*.

5.2 The Use of the computer for work within the Home

Parents and children engaged in a range of computing activities within the home. While game playing was a key activity for most children, they also engaged in a range of other uses for leisure and for community-related and school-related purposes. The three main 'work-related' activities that children engaged in within the home were word processing, desktop publishing

and accessing information. These activities often brought parent/s and children together in teaching and learning roles. In general parents were very positive about the skills the children were developing, the way the computer helped the children with these tasks, and the impact on their school work

5.2.1 Word processing

Parents and children spoke positively about the ability of word processors to make the task of writing (communicating ideas) easier. Their explanations included the speed of task completion, the quality of the look of the final product and the ease of correcting and editing. One girl commented *" it is harder to try and write neatly on a piece of paper but instead you can type something up and don't have to worry about mistakes because you can just do a spelling check and it just goes to work and then instead of writing down and making mistakes you just print it out"*.

A number of parents mentioned that it did not necessarily improve the content of the writing. One comment from a parents was *"you get a better end-product but the intellectual component is the same"* although one mother believed that her child wrote more *"She would never have been writing as much as she's written"*.

In terms of the quality of the presentation, many parents felt that presenting neat work gave the children a sense of pride. As one father put it *"it gives them an appreciation of perfect presentation"*.

By far the editing facility of the word processor received the most number of positive comments from parents and children. As one parent stated *"that's the wonderful thing about word-processing, it's just wonderful to correct a little mistake like that"*. One of the children put it this way *"you can save it and print it out as many times as you like and fix up mistakes easily"*.

As well as presenting a range of advantages for writing, many of the parents expressed concern about the loss of handwriting practice if children use the word-processing programs instead of handwriting. One mother compared the use of the computer for writing to using a calculator to do maths. Another mother said that it makes children lazy. One parent stated that *"I don't think he's had to try, regarding the formation of letters at his age, formation of a writing style, because he's not constantly practising it you know when he's writing essays"*. A number of parents and children also pointed out that the word processor had advantages for children with poor handwriting *"if you don't have good handwriting it is better to use a computer"(boy)* and *"he's very embarrassed about his writing so for him I think he'd use a word-processor every time he had to write" (mother)*.

5.2.2 Desktop publishing

Desktop publishing refers to the use of borders, columns, tables, font types, colours and sizes and / or word art to improve the design and layout of word processed texts. While many parents and children did not separate the act of word processing and desktop publishing, they

did comment about the importance of the quality of the look of the final product and that their children were aware of the possibilities.

Some families and children developed significant expertise in designing and laying out cards, invitations, posters, newsletters and projects. With the use of colour printers, many of these children were able to hand in at school professional looking documents. In one family, the child was responsible for producing a regular newsletter for a club to which the whole family belonged. A brother helped with the manipulation of scanned in photographs, but apart from that the child had the main responsibility for the newsletter. In another family the mother took great care to teach the children how to design and layout their work and also how as save and reuse certain of the more sophisticated elements such as headings and tables.

All of the children were competent at taking graphics from clip art collections or images from CD Rom encyclopedia and integrating these into their texts.

5.2.3 Accessing Information

Both parents and children believed that accessing information was easier on the computer, either from a CD Rom or the Internet. So easy, in fact that a number of the children would browse and search for information as part of their leisure activities *"She really likes to look things up and it's so easy to do it using the computer"*. A number of parents felt that this aspect of computing was probably the most important in terms of the children's schooling *"I think the access to information is the most important"*. The children, too, expressed views about the ease of use compared to books and libraries *"It's easier to locate and select the information you want"* and *" it (the Internet) is not like a library where there is a limited number of books and where everyone borrows the book on the subject and there are no books left. So everyone can look at the same site at the same time"*.

Parents also spoke about other advantages of using electronic sources of information. These included amount, accessibility and currency. Parents' comments included *"there's so much more information available if you're doing it through a combination of CD roms and Internet than there would be just in your average library"*; *"Some of the information I couldn't get anywhere, whereas it was a bit more accessible on the Internet"* and *"On the Internet the information is very current information. Things can be published immediately - it's instant"*.

In juxtaposition to these positive comments a number of parents expressed some concerns about the shift from print to electronic sources. Such comments included *"I think technology wise they lean towards it rather than a book"*; and *"It's sad to lose an appreciation of books"*. One father, who was concerned that most of the electronic information on CD Roms and the Internet came from American sources, made the comment *"I think to some degree it discourages kids from going to the library and looking up the databases there which is probably giving them a better view"*. One father questioned whether *"you may be less likely to remember it than if you had to go on a bus and go to the library and find a book"*.

5.3 The Use of the Computer for Recreation within the Home

When considering the use of the computer for recreation parents, like their children, used the language of "play" and "games" regardless of the activity being undertaken. Computing activities were generally experienced as fun and the computer was seen as being able to make work activities more enjoyable for both children and adults. As one mother explains about her work at the computer *"Sometimes I enjoy what I'm doing so much that it might as well be play"*.

Children also engaged in enjoyable recreational activities which bridged the notions of 'work' and 'play'. These included browsing through information on the Internet and CD rom, communicating with friends by email and writing for personal reasons, drawing and manipulating images and sounds, and exploring how various pieces of software worked.

Half of the children browsed through information on the Internet (or bulletins boards) as a form of entertainment but were generally given a time limit such as half an hour. More often they were encouraged to search for specific information for projects or interest and find suitable sites in directories for children or sites suggested by teachers. One child used the Internet for social amusement by playing around with sites and deliberately perpetuating viruses. His parent explained *"He finds viruses and plays tricks on his friends, because a lot of his friends are on the Internet too. They get some site together and set one of their friends up to ring it up, you know, and do all sorts of things like that"*..

Two of the girls in the study engaged in socio-dramatic play using the computer as a "prop". Their play involved the modelling of real-life situations in offices, hotels and shops. Activities included typing, dictating, making menus, preparing guest lists, scanning and making bar codes, and imitating the behaviour of staff and management.

The word 'game' also had multiple meanings depending on the respondents' social backgrounds. Children's concepts of 'game' ranged through the continuum of violent shooting games, platform adventure games, simulation games, competitive games to educational software containing an element of fun.

Educational games in particular were viewed as an enjoyable way for children to learn basic skills such as reading, maths, spelling and general knowledge. From a parent's perspective *"It gives a wonderful, interesting, varied way to learn those basic things"* and from a child's perspective *"I suppose you can compare it to how my mum makes me write my times tables out so many times whereas on the computer you can play, like there's multiplication games and things like that and you usually get the hang of it"*.

It has been reported elsewhere that parents want children to continue involvement in traditional leisure pursuits such as music and (Apple Computer Australia Pty Ltd, 1996). Many of the children in this study were listening to music and reading information on the computer as significant leisure activities. In fact one father believed that playing educational games helped his daughter with reading. *"She would sit there for hours you know (playing games) so I considered that learning ... she was a bit slow on reading..., didn't matter what it was as*

long as she was reading something and working out and comprehending what was going on, so we were quite happy for her to play that".

Many family members, even parents, sometimes engaged in game playing as a form of relaxation. In general, parents were comfortable about children using the computer to play games provided there was some educational or recreational value in them, they were not used excessively or in preference to homework being completed. Several parents specifically stated their objections to the levels of violence in some of the arcade-type games and would not permit them to be brought into the home.

Parents shared their children's views that game playing can develop cognitive skills such as logical thought, decision-making, planning, problem-solving, memory, concentration, comprehension, reading and general knowledge. Physical skills such as hand-eye coordination, dexterity and quick reflexes were also mentioned. Again parents shared their children's views that fantasy, action, competition, challenge, instant responses, choices, control, information and graphics were the aspects of computer game software which they found to be appealing.

Most families intended the computer to be used mainly for educational purposes rather than solely for entertainment. Two mothers commented *"I don't want them to use it as a toy"* and *"I don't believe in sticking kids in front of the computer to play games. But while there are a couple of games which they do play which are purely computer games with no real skill in them, if you want the ability to master them, in the limited number of tasks that that game requires, I just think that that's boring and mind numbing. That's not really a positive use for a computer"*. These views were supported by the general rules in families that 'working' on the computer took precedence over playing games.

5.4 The Impacts of the Computer on Family Life

Families shared their perspectives on the general impact of the computer on their family life. Key themes to emerge were 'sociability', 'taking up time' and 'safety'.

5.4.1 Sociability

Families made careful decisions about the location of their computer(s) in both public, semi-public and private spaces. Issues associated with locating the computer in a public place varied from wanting to make it accessible to not wanting it to become central to communal living. Parents explained *"I suppose what happened is that the computer landed up in a central spot which was a table in the family room and the children seemed to do their homework on it"* and from the other perspective *"We have a TV, but it's very peripheral to our communal rooms and we felt the same about the computer, we didn't want it to occupy the central place. So we just had to make, we made physical space for it, but peripheral to, it's not in a common area, you know, it's in a room that we all use but it's not a sociable thing to do to be on the computer in this house and in the same way it's not a sociable thing to be watching television"*.

Spending time on the computer was mostly viewed as an individual pursuit. However, a number of situations were described in which family members were involved in joint

computing activities not necessarily related to education or work which seemed to create an ideal learning environment for the children eg. family members designed business letter-head together, booked theatre tickets through the Internet, built home-made computers, played networked games, produced club newsletters, learnt how to use the Internet, loaded software and solved technical difficulties.

Using the Internet for email and online chatting in some ways moved computing from an individual pursuit to more of a social activity. The children reported that they talked to friends, found new friends and communicated with adults (extended family members and commercial and professional sources of advice) to seek technical advice. One parent commented *"I wouldn't consider it a particularly social activity in that you're very removed from the person so it's not terribly personal. But I guess, you know, any sort of communication would be considered a social activity of sorts"*.

Children and parents also spoke about the playing of computer games with family and friends when they come to visit as well as playing games online. A child stated *"Well when we invite visitors for a dinner party or something like that I sometimes play with them (on the computer)"* and a mother commented *"If someone comes over to play, they'll sit down and they'll play games"*.

5.4.2 Using up time

When family members spend time at the computer, they rearrange their family time to incorporate computing activities. Time is often removed from television viewing because computing activities are seen as more "productive" and "educational". Four parents commented that the family watched less television since the computer had arrived and half of the children also reported having watched less television since the arrival of the computer. The remaining families had owned computers for such considerable lengths of time that the children were unable to remember life without a home computer.

One parent, who himself is a computing enthusiast, said that the computer took time away from other activities but not necessarily television *"...And it was just the other night I was thinking it would be a good thing just to throw these computers out completely and get back to a normal life. You know, go out and actually mow the lawn or see what the lawn looks like. Do a bit of maintenance around the place. Over the years I think it's quite evident, the computer takes a lot of so called leisure time and you know people used to go out and have a barbecue, swim in the pool, prune the roses, it's sort of done as a necessity now when it gets too bad rather than normal maintenance type of stuff. It's definitely changed the our way of life..."*

Several family members spoke about game playing being very time-consuming. One boy stated *"Oh you play it for ages. You don't realise the time. You do some of the levels for at least 40 minutes sometimes"* and a parent agreed *"I think, oh I'll just give myself a five minute break and do a couple of levels of Lemmings or something and I find half and hour later I'm completely engrossed and quite frustrated with it"*. Others found using the Internet to be very time-consuming, with one parent adding *"...most of the Internet is a waste of time"*.

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These concerns relating to spending too much leisure time using the computer resulted in family rules being created about when and for how long the computer could be used, in particular to prevent excessive game playing and use of the Internet. It also produced general advice from parents to go outside and play. Several boys in the study were prevented from becoming computer addicts by parental monitoring of their behaviours. One parent commented *"We often tell him that he's been there too long. Why doesn't he go out and do something outside?"*

As well as commenting about spending time using the computer a number of parents and children made comments about saving time. In particular word processing was seen to save the time associated with re-copying out texts by hand, and with reducing the time it takes to send out family letters to a variety of people by using the cutting and pasting facility. Having access to CD Rom and the Internet saved time by reducing reliance on trips to the library. Both parents and children made comments about saving trips to the library for information *"...instead of taking them down the library, wandering up and down the aisles just to find that the book's not where it's supposed to be" (father)* and *"Especially in the nights because you're always trotting off to the library ten times a week and I thought oh this might help, I won't have to go out as much" (mother).*

5.4.3 Safety

A number of parents spoke about the computer as a new source of information and recreation within the home which lessens the need for families to leave their homes. One aspect of this related to the perception of it not being safe to allow children to spend time outdoors unsupervised. One mother explained *"It probably is safe, but you know the perception of it not being so and protecting them. And I think young people are kept inside now whereas before they were encouraged to go out. So I think we have to have found a substitute for that ability to roam wide and free along the streets and to the library and to any other places where you get information. And we now drive them to where they want to go and so their other alternative is to access it through their computer".*

Another parent, who had real concerns about the nature of the neighbourhood in which they lived explained *"One main reason is that it will keep them at home and out of trouble ... Keep them at home where they can stay and do their work and play the computer. It will help them to improve their skill. And otherwise they might go outside and play with other kids and who knows who they might play with. It might be some bad kid who would have an influence on them in the use of drugs or other bad habits".*

A second area of concern about safety stemmed from the corollary of the convenience of access through the Internet to so much information within family home. A few parents expressed some concern about children gaining access to inappropriate or harmful information. One way parents dealt with this was by imposing restrictions and supervising use of the Internet. One mother commented *"I'm going to be monitoring him too. He's not allowed to use it when we're not at home...".* Another parent encouraged the children to only access moderated chat rooms, bulletin boards and email lists.

5.5 The School Computing Environment

Each of the children differed in terms of the computing environments within their schools. Types and numbers of computers varied across the schools, as did their configuration. Three schools had computer rooms or laboratories and the rest had computers in classrooms, laptop computers or a combination of the above. In all schools the primary focus of computing was across curriculum use, however one school supplemented this with well-defined systematic instruction in computer use.

All of the children reported that they had access to computers at school during class time and during library time and in some cases informally at before or after school, at morning and lunch breaks either within their own classroom, in the library or through special interest groups. One child, from a single-sex boys school, however, reported that at the time of interview his class had been banned from the school's computer facilities for misbehaviour associated with 'hacking' into the school's network. Three other children reported that they rarely did any computing as part of the regular classroom work. Interestingly, children from the same schools reported very different experiences based on having different classroom teachers.

The teachers that were interviewed seemed to fall into two groups: identified computing specialists and classroom teachers. All groups of teachers talked about some of the major difficulties associated with integrating computers into classroom learning. Only the computing specialists and a small number of the classroom teachers were able to effectively integrate the technologies into the teaching and learning within their classrooms.

5.5.1 Computing Specialists

Only one of the schools employed a computing teacher to work across the Kindergarten to Year Six grades. In several of the schools, however, there were one or more identified computing specialists among the classroom teachers and school executives. In another school the identified computing specialist had just left the school and another teacher, with less expertise had taken his place. Parents and children from another one of the schools, spoke about an identified computing specialist who had done excellent work across the whole school with curriculum projects involving email and accessing information from overseas and other Australian schools. They commented that once that teacher left, several years ago, there seemed to be less computing and little Internet or other telecommunications projects taking place. Both parent and child interviews supported the idea that the child's experiences with computers at school relied more directly upon the individual classroom teacher's expertise and interest than on the overall hardware provision and policy framework within the school.

Teachers who were seen as computing specialists within their school generally had had access to computers in their homes for ten years or more, had undertaken a variety of courses in aspects of computing over the years, and had themselves lead professional development activities for other teachers in schools. These teachers shared a degree of expertise and

comfort with computers, not commonly found among their peers and had a vision for the role of computing in education in general, and their school in particular.

5.5.1.1 Using the Internet

The recognised computing specialists had a variety of responses to the use of the Internet. All three believed it was a valuable source of information. When talking about its use in education they mentioned that it could be used to *"improve general knowledge"*, *"teach information skills"* and *"broaden experiences"*. All three teachers had obviously thought deeply about the role and impact of technologies such as the Internet and were facing some of the dilemmas it created for teachers and children.

One of the teachers, who used the Internet within the school and the classroom, also regularly published information about the Internet and some useful sites in the school's newsletter. He viewed the Internet mainly as an excellent source of information, but expressed some concerns about the extra skills children will need to able to sift through large quantities of information for relevance and accuracy *"...on the Net there is so much garbage... you forget that it's been put on by anyone and quite often by kids"* and to synthesise the useful information that they find. As well he expressed concerns about over reliance on the Internet as a single source of information, even in his own research *"I'm finding the Net 's making me lazy, because all you do is... use a search engine to go and find something for me whereas before I would have gone and looked in books in the library and things like that...now I get it to do it for me.. and quite often if I don't find it on the net I think 'oh well its not there, its not worthwhile finding..."*. This particular theme of over reliance was mentioned by a number of other teachers and parents.

Another teacher who saw lots of potential in the Internet for accessing information, recognised the dilemma of balancing exploratory time and productive time when using the Internet *"they could just sit and waft off and do things...find interesting things... yet off on a tangent...I do it myself... think you have to be flexible"*. Again this notion of concerns about time was shared by some of the parents.

The third teacher used the Internet as part of integrated curriculum projects such as Newsdays and the National Geographic projects which involve children collecting information and sharing it with children in other places around the world. He values most the breaking down of the walls of the classroom and the community *"...some of these kids have never been out of (name of suburb), and now all of a sudden they're talking to schools in Russia. It's opening... the world's coming into their classroom...at least within the bounds of the school complex, they can be anywhere in the world at any time..."*. Interestingly the computing specialist from a more affluent school, when talking about how childhood today is different for the children he teaches, links this facility with general concerns about childhood. *" they take a lot of things for granted... like talking to people at NASA and the South Pole...they don't seem to have as much fun ... they get bored... there are no mountains to climb anymore..."*.

5.5.2 Classroom teachers

Nine teachers in the study were classroom teachers with varying degrees of expertise, commitment and interest in using computers in their classrooms in a range of teaching and learning activities. Almost all of these teachers had a computer in their homes, or had access to a laptop computer at school that they could take home in the evenings. Some of these teachers have had computers in their homes for more that five years. Most of these teachers were very comfortable with the notion that the computer was useful in helping them record, document and communicate through word processed letters and desktop published newsletters and notices. One teacher who has developed a fairly negative attitude to computing asked a son to type up things for him when he needed them. In contrast another teacher constantly asked her son to teach her more about computers. Only one of these teachers had access to the Internet in his home, however that teacher did not use it at all.

Some of these teachers reported that their school had a reasonable amount of equipment, distributed and organised in ways that suited their approach to teaching and learning. Their schools had also had a long history of computing being a priority for resource allocation and professional development. Other teachers were critical of the amount of equipment in their school, of the way access to the computers in their schools were organised, and /or of the lack of support and professional development opportunities in their schools.

These school factors did not seem to directly relate to the personal responses of the teachers themselves, in so far as the teachers from the same schools had very different levels of expertise, commitment and interest in using computers within their classrooms for teaching and learning.

To varying degrees all the teachers used the school's computers within their classrooms or in the school's computer room, for writing, publishing and /or accessing information. In general two basic rationales seemed to lie behind their uses of the computers. One related to computer literacy: the children needed to be taught a range of 'new skills' so they can use computers, which are now permeating every aspect of life outside of school. The other related to the use of a computer as a tool to improve teaching and learning: specifically, children can use computers to improve the quality of their work. As with parents, the first of these notions was a clearly articulated reason for purchase / use of computers, while the second was more often considered as an outcome from the use of the computer. In terms of the 'improvement' as an outcome, both parents and teachers identified advantages and disadvantages in the changes in processes and outcomes.

In terms of word processing, teachers generally agreed with parents and children about the advantages of writing with a word processor - speed, ease, time to edit, quality of look of final product. In addition, more of them stressed the advantage of motivation: many children like to write with a word processor rather than with pen and paper. As well they identified the related disadvantage of the growing disinterest in handwriting.

When talking about accessing information, teachers made similar comments as parents and children about the advantages of using computers to access information. As well, they were very concerned about children's need to acquire or improve information handling skills so that

they can effectively move through the processes of identifying accurate and relevant information, analysing and synthesising this information in terms of their set task or project. In particular teachers expressed justifiable concern about how the electronic technologies made it easier to plagiarise ideas and 'copy and paste' whole slabs of text. Teachers also had concerns about the readability of the texts and the type of information provided on topics in the commonly used electronic sources (CD Roms and The Internet). They argued that these texts were often too difficult for many of the children in their Yrs 5 and 6 classrooms.

5.6 Common Themes in the Home and the School

As well as the above mentioned similarities between teachers and parents views on computing two main themes emerged which seemed to bridge the homes and the schools. These were adults concerns about 'gaining and losing skills' and the link between having some of these new skills and the self esteem of children.

5.6.1 Gaining and Losing Skills

Many teachers and parents spoke at length about the loosing of some existing skills and understandings associated with accessing information and communication within the world of print. Concerns about poor handwriting, spelling, reading books and using a library typify their concerns. On the other hand all parents and most teachers strongly believed that the new skills associated with the new information technologies need to be taught and are essential to survival in the wider world. Many of them wanted their children to straddle both technologies and develop expertise in both. One mother shared her frustration about her son who virtually puts all his writing on the computer *"I say 'Why are you using the computer like this? I want you to write'. I say 'You'll forget how to write soon if we don't stop this.' So we now set aside some things are just not done on the computer"*.

While this comment, clearly demonstrates frustration it also indicates the dilemma faced by children in today's world. While their parents and teachers can understand and articulate the need for children to straddle both worlds, many children are not only losing the skills but also the motivation to be bi-literate. This clearly comes through in the teachers' comments about the growing disinterest in handwriting and the parents' parallel comments about the children's loss of the skill of handwriting. Similar comments were made about the loss of interest in using a library, though interestingly no adults were concerned about the possibility of children losing the skills of using the library. One parent did comment, however, about *"losing love of books"*, and another had gone to the trouble of purchasing both the book and the electronic copy of an encyclopedia. Does this imply that adults are more comfortable with the notion that sooner than later library skills will be less important, whereas for the foreseeable future children will need to be able to write with pen and paper? Some light can be thrown on this comparison through the comments of two parents and a teacher who when discussing handwriting referred to the fact that it was still the mandatory process for taking school examinations such as the Higher School Certificate.

5.6.2 The Promotion of Self-Esteem and Leadership Qualities

Owing computers and possessing advanced computer skills are not yet commonplace in our society or in our schools. Children who possess these skills are different than their peers, and sometimes more knowledgeable than their teachers and their parents. In most cases these differences increase the possessor's self esteem and potentially make them leaders in the community of their homes and classrooms. Many parents and teachers commented on aspects of self esteem and leadership as two of the outcomes of children coming from 'technology rich' or 'technology capable' families.

5.6.2.1 Self-Esteem

Involvement in computing activities was seen to enhance self-esteem in a number of ways. These included owning and being allowed to operate an expensive piece of equipment like a computer caused the user to feel good about him/herself. A degree of prestige was involved especially when not everyone in the local community owns or knows how to use a computer. A parent speculated *"I think probably there's a bit of prestige involved in having a computer. You're one of the chosen few who do"* and a child agreed *"Well I think some of them are really jealous because not many of them have computers like that"*.

There were also benefits to self-esteem in using the computer as a tool for the production of something "worthwhile". Here the benefits were both intrinsic and extrinsic. The user feels good about the process of producing a newspaper, newsletter, project, story, poem, essay, invitation, poster, calendar, card, banner or drawing, just as a craftsperson would. The end-product is then subject to reinforcing comments from siblings, parents, peers and teachers *"I think it gives them a measure of pride"*, *"Actually producing something that's worthwhile"* and *"I think when they see their work presented well, I think they're more proud of it"*.

Self esteem also increased because of expertise. Computer expertise is highly valued in the community, especially the ability to solve technical computer problems. Computer skills and knowledge are extraordinary in the true sense of the word. One parent explained *"I think it's, from a personal point of view, it's a feeling of accomplishment and a feeling of being a good and sort of useful person. You know, to have everybody wanting information from you, from friends and family"* and *"Once you become good at it, it becomes a circle that you become praised a lot for doing it and you become a big person in your little group because you know more than anybody and that becomes a circle, you know, the more you know the more you want to know because the better you feel because you know, everybody keeps asking you and the more they ask you, the more you want to know..."*. Knowledge about how the computer works, the types of things computers can do and computer familiarity were viewed as giving a person access to opportunities in the future. One teacher explained *"...life is computers and it helps them when they leave school"*.

Teachers also raised children's self esteem by praising them for their special contributions to the class. Several children conducted their own research at home on the topics which were currently being studied in class. They took the information to school. One child was motivated by the idea of helping the class teacher and class members to locate interesting information. Two other children received praise for their contributions of information from CD rom encyclopaedias to the class. A child and a teacher commented *"My teacher will be impressed*

because not many people will get the news that I'm getting from the computer" and *"They (the children) like to be able to walk in and say, this is the information I got from the computer, or this is the information I got from the Internet. You know they're really proud of themselves"*.

5.6.2.2 Leadership Skills

The children also identified situations in which they helped, taught or showed others about the computer. It was found that two children regularly helped their siblings, five children had enough ability to be able to assist their parents and four children helped visitors to the home and extended family members. In at least three quarters of the families parents were open in admitting that a child or children in the family had progressed beyond the parents' level of expertise, although in some cases the parents had been their original teachers. A number of teachers were also comfortable with children's expertise outstripping their own. One teacher stated *"I think it's a great thing for the kids to see that we're not experts at everything and that they can teach us as well as we teach them"*.

Three children were identified by teachers as leaders in the classroom and five others were comfortable helping their close friends at school. These children undertook a variety of leadership roles within their schools or classrooms. One boy, who had literacy difficulties, played a key role in helping the resource teacher when she withdrew children with special needs from their classes to work with them in the computer room, and in previous years, when there was a specialist computing teacher and the digital cameras had not been stolen, he had played a leading role in working with photographic images and texts.

Three boys had sufficient technical knowledge to be able to independently fix computer problems however two of these students were not permitted to use the school computer at times; one because of constant hacking by classmates and the other because he occasionally had computer privileges withdrawn for mucking around in class. The third student often exchanged information, web sites and computer tips with his teacher by E-mail. In this scenario his status was elevated.

It was felt that children were able to gain recognition for themselves as well as useful leadership and teaching skills from being facile with computers. One parent commented *"All sorts of skills and not only skills for himself, but skills to be able to teach others as well"* and *"The ones that are computer literate sort of become group leaders"*. One father demonstrated to his oldest son how to load software and set up the computer so that later on the son would be able to teach other family members.

6. Conclusion

This study found that children experienced significantly different home computing environments, based on the computing resources and expertise with the home. Parents from computer-owning households, however, generally had similar views about the role and impact of the home computer on family life, and in particular on the life of their children. Three interesting family themes were the role of the computer in the social life of the family,

computing as an activity that takes up time and saves time, and the role of the computer in making children more and less safe. Within the school environment, children also experienced significant differences in the computer environments, particularly related to the personal beliefs, expertise and confidence of their classroom teachers.

Importantly, teachers and parents generally shared similar views about the importance of using and learning about computers, the value of word processing, desktop publishing and accessing information from electronic sources. Teachers particularly identified children's need to learn how to effectively handle large amounts of information as a key skill which needs much emphasis, particularly with regard to accessing information from the Internet and other electronic sources.

Parents and teachers also recognised that at the same time as gaining new skills associated with these processes, some children were losing interest and skills related to similar processes within the print environment. Many parents and teachers believed that possession of strong computing skills and interests (including game playing) had the potential to increase a child's self esteem and to provide opportunities for leadership within the family and their school.

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